

DAIMLERCHRYSLER

DaimlerChrysler Corporation

Stephan J. Speth

Director
Vehicle Compliance & Safety Affairs

October 10, 2003

Ms. Kathleen C. DeMeter, Director
Office of Defects Investigation
National Highway Traffic Safety Administration
400 Seventh Street, S.W.
Washington, D.C. 20590

Dear Ms. DeMeter:

Reference: NVS -213cla; EA03-004

This document completes DaimlerChrysler's response to the referenced inquiry dated August 26, 2003 regarding information concerning wheel stud field experience on 1997 through 2003 DaimlerChrysler Voyager, Caravan, and Town & Country minivan vehicles.

DaimlerChrysler's review of complaints, warranty claims, and parts demand has not identified any issue with the subject vehicle's wheel retention system. We attribute the absence of these issues to our design philosophy, our adherence to stringent design standards, combined with our comprehensive vehicle testing program whereby vehicles undergo hundreds of thousands of miles of durability testing in a variety of environmental conditions prior to vehicle volume production. DaimlerChrysler has received a minimal number of complaints of wheel separation due to wheel stud fracture from a population of over 3.3 million of the subject vehicles, and most of those complaints can be attributed to improper removal or reinstallation of the wheel during vehicle servicing.

In summary, DaimlerChrysler's review of this information has identified no indication of any wheel retention system issue with the subject vehicles.

Sincerely,



Stephan J. Speth

Attachments and Enclosures

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- Q1. State by model, wheel type, and model year, the number of peer vehicles DaimlerChrysler has manufactured for sale or lease in the United States. Separately, for each peer vehicle manufactured to date by DaimlerChrysler, state the following:**
- a. Vehicle Identification number (VIN);**
 - b. Wheel type;**
 - c. Model Year;**
 - d. Date of manufacture;**
 - e. Date warranty coverage commenced; and**
 - f. The State in the United States where the vehicle was originally sold or leased (or delivered for sale or lease).**

Provide the table in Microsoft Access 2000, or a compatible format, entitled "PRODUCTION DATA." See Enclosure, Data Collection Disc, for a pre-formatted table that provides further details regarding this submission.

- A1. Enclosure 1 (CD-rom) contains the information requested for DaimlerChrysler vehicles manufactured for sale in the United States in the specified Access 2000 format.**
- Q2. State the number of each of the following, received by DaimlerChrysler, or of which DaimlerChrysler is otherwise aware for the peer vehicles, which relate to, or may relate to, the alleged defect in the subject vehicles:**
- a. Consumer complaints, including those from fleet operators;**
 - b. Field reports, including dealer field reports;**
 - c. Reports involving a crash, injury, or fatality, based on claims against the manufacturer involving a death or injury, notices received by the manufacturer alleging or proving that a death or injury was caused by the alleged defect in a subject vehicle, property damage claims, consumer complaints, or field reports; Property damage claims; and**
 - d. Third-party arbitration proceedings where DaimlerChrysler is or was a party to the arbitration; and**
 - e. Lawsuits, both pending and closed, in which DaimlerChrysler is or was a defendant or codefendant.**

For subparts "a" through "d" state the total number of each item (e.g., consumer complaints, field reports, etc.) separately. Multiple incidents involving the same vehicle are to be counted separately. Multiple reports of the same incident are also to be counted separately (i.e., a consumer complaint and a field report involving the same incident in which a crash occurred are to be counted as a crash report, a field report and a consumer complaint).

In addition, for items "c" and "d" provide a summary description of the alleged problem and causal and contributing factors and DaimlerChrysler's assessment

of the problem, with a summary of the significant underlying facts and evidence. For items e and f, identify the parties to the action, as well as the caption, court, docket number, and date on which the complaint or other document initiating the action was filed.

- A2. a) There are 32 customer complaints representing 28 unique vehicles that allege wheel stud fracture. Eleven of the 32 complaints (10 vehicles) allege wheel separation. Ten of those 11 complaints were from higher mileage vehicles, which can be expected as higher mileage vehicles have had more tire rotations and other service performed, which allows the opportunity for stud damage and improper torque application during wheel removal and re-installation. Five of the complaints alleging wheel separation were from vehicles that had recently been purchased used or had recently been serviced. One complaint indicated that there was substantial warning prior to the wheel separation. DaimlerChrysler inspected two of the wheel separation complaints, and in both cases determined that the stud fracture was due to either improper nut installation or installation of aftermarket wheels that included a spacer.
- b) There are three field reports that allege wheel stud repair on the subject vehicle population. One of these reports is also identified as a CAIR incident report as reported above.
- c) There are no crash, injury, or fatality incidents that allege wheel stud fracture as the cause on the 1997-2003 DaimlerChrysler minivan vehicles.
- d) There are no third-party arbitration proceedings where DaimlerChrysler is or was a party to the arbitration that related to wheel stud fracture on 1997-2003 minivan vehicles.
- e) There are no lawsuits, either pending or closed, that related to wheel stud fracture on the subject vehicles.

The following chart summarizes the customer complaints and field reports for the subject model years of the investigation.

category	CAG	CAIR	Grand Total
alleged wheel separation		11	11
wheel stud broken	1	18	19
wheel stud repair	2	3	5
Grand Total	3	32	35

- Q3. Separately, for each item (complaint, report, claim, notice, or matter) within the scope of your response to Request No. 2, state the following information:**
- a. DaimlerChrysler's file number or other identifier used;**
 - b. The category of the item, as identified in Request No. 2 (i.e., consumer complaint, field report, etc.);**
 - c. Vehicle owner or fleet name (and fleet contact person), address, and telephone number;**
 - d. Vehicle's VIN;**
 - e. Vehicle's make, model and model year;**
 - f. Vehicle's mileage at time of incident;**
 - g. Incident date;**
 - h. Report or claim date;**
 - i. Whether a crash is alleged;**
 - j. Whether property damage is alleged;**
 - k. Number of alleged injuries, if any; and**
 - l. Number of alleged fatalities, if any.**

Provide this information in Microsoft Access 2000, or a compatible format, entitled "REQUEST NUMBER TWO DATA." See Enclosure, Data Collection Disc, for a pre-formatted table that provides further details regarding this submission.

Produce copies of all documents related to each item within the scope of Request No. 3. Organize the documents separately by category (i.e., consumer complaints, field reports, etc.) and describe the method DaimlerChrysler used for organizing the documents.

- A3. Enclosure 2 contains the information detail requested for the incidents described in the answer to question #2 in the Access 2000 format.**
- Q4. State, by model and model year, a total count for all of the following categories of claims, collectively, that have been paid by DaimlerChrysler to date for the peer vehicles that relate to, or may relate to, the alleged defect in the subject vehicles: warranty claims; extended warranty claims; claims for good will services that were provided; field, zone, or similar adjustments and reimbursements; and warranty claims or repairs made in accordance with a procedure specified in a technical service bulletin or customer satisfaction campaign.**

Separately, for each such claim, state the following information:

- a. DaimlerChrysler's claim number;**
- b. Vehicle owner or fleet name (and fleet contact person) and telephone number;**
- c. VIN;**
- d. Repair date;**

- e. Vehicle mileage at time of repair;
- f. Repairing dealer's or facility's name, telephone number, city and state or ZIP code;
- g. Labor operation number;
- h. Problem code;
- i. Replacement part number(s) and description(s);
- j. Concern stated by customer; and
- k. Comment, if any, by dealer/technician relating to claim and/or repair.

Provide this information in Microsoft Access 2000, or a compatible format, entitled "WARRANTY DATA." See Enclosure, Data Collection Disc, for a pre-formatted table that provides further details regarding this submission.

- A4. Enclosure 3 contains the warranty information relating to wheel hubs and wheel studs for the 1997-2003 DaimlerChrysler minivan vehicles.
- Q5. Describe in detail the search criteria used by DaimlerChrysler to identify the claims identified in response to Request No. 4, including the labor operations, problem codes, part numbers and any other pertinent parameters used. Provide a list of all labor operations, labor operation descriptions, problem codes, and problem code descriptions applicable to the alleged defect in the subject vehicles. State, by make and model year, the terms that DaimlerChrysler offers for new vehicle warranty coverage on the peer vehicles (i.e., the number of months and mileage for which coverage is provided and the vehicle systems that are covered). Describe any extended warranty coverage option(s) related to the alleged defect that DaimlerChrysler offered for the subject vehicles and state by option, model, and model year, the number of vehicles that are covered under each such extended warranty.
- A5. The following labor operations and failure codes were queried for the information provided in the answer to question #4.

<u>Labor Operation Description</u>	<u>Labor Operation Code</u>	<u>Comment</u>
Wheel Mounting Stud Replacement	22-30-07-00	stud replacement
Wheel Mounting Stud Replacement	22-30-07-02/03	right/left
Wheel Mounting Stud Replacement	22-30-07-08/09	right/left
Wheel Mounting Stud Replacement	22-30-07-10	additional stud

<u>Failure Code Description</u>	<u>Code</u>
Shortage Part	SE
Stripped -Threads	X8
Broken or Cracked	11
Uncodeable	UC

The Basic Warranty provided by DaimlerChrysler for the subject vehicles was a 3 year/36,000 mile bumper-to-bumper warranty. There were no extended warranty coverage options related specifically to the subject components.

Owners did have the option of purchasing additional warranty coverage through third-party providers; however these plans are not affiliated with DaimlerChrysler, this warranty data is not available to DaimlerChrysler, and therefore is not included in this response.

- Q6. Produce copies of all service, warranty, and other documents that relate to, or may relate to, the alleged defect in the subject vehicles, that DaimlerChrysler has issued for the peer vehicles to any dealers, regional or zone offices, field offices, fleet purchasers, or other entities. This includes, but is not limited to, bulletins, advisories, informational documents, training documents, or other documents or communications, with the exception of standard shop manuals.**
- A6. There are no service, warranty, and/or other documents that relate to, or may relate to, the alleged defect in the subject vehicles, that DaimlerChrysler has issued to any dealers, regional or zone offices, field offices, fleet purchasers, or other entities.**
- Q7. State the number of each of the following, components that DaimlerChrysler has sold for use or possible use in the peer vehicles by part name, part number (both service and engineering/production), model and model year of the vehicle in which it is used, and month/year of sale:**
- a. Wheel studs;**
 - b. Wheel nuts;**
 - c. Front wheel hubs; and**
 - d. Any kits that have been released, or developed, by DaimlerChrysler for use in service repairs to the subject component/assembly.**

For each component part number, provide the supplier's name, address, and appropriate point of contact (name, title, and telephone number) Also identify by make, model and model year, any other vehicles of which DaimlerChrysler is aware that contain the identical component, whether installed in production or in service, and state the applicable dates of production or service usage.

- A7. Enclosure 4 contains part demand for the wheel studs, wheel nuts, and wheel hubs for the 1997-2003 DaimlerChrysler minivan vehicles. The M12 wheel studs and wheel nuts that are described in the part demand information provided above are used on other DaimlerChrysler vehicles (more than 5,000,000 1992-2003 vehicles). Therefore the part demand for these items is not solely representative of usage on the 1997-2003 minivan vehicle population. Enclosure 5 contains the part number information, production and service numbers and supplier information.**

- Q6. Furnish copies of all engineering standards, performance specifications, quality assurance specifications, and documents related to validation testing for the subject components and for stud/nut fasteners in general.**
- A8. Enclosure 6 contains five groups of documents that address the wheel stud/nut performance factors for the subject vehicle wheel attachment.**
- A. Wheel-Stud Nut Tightening Requirements PS-3784.**
 - B. Engineering specifications for the manufacture of wheel studs and wheel lugs on the subject vehicles (see Wheel Stud-Nut)**
 - C. Vehicle Durability Test Programs.**
 - 1. K1-On Road Two Wheel Drive Endurance**
 - 2. BCQ-Automatic Transaxle Endurance**
 - 3. VE-Vehicle Endurance Automatic Transmission**
 - 4. AV1-Arizona Vehicle Endurance-4 speed Automatic**
 - D. Vehicle Corrosion Testing Durability -LP461H117**
 - E. Automated Manufacturing Planning System (AMPS) informational documents.**

These documents will be provided to the office of chief counsel with a request for confidentiality.

- Q9. State the basis for each specification and performance standard related to durability and provide the following additional information regarding the durability of the subject components:**
- a. State whether and how the specification addresses the effect of torque relaxation;**
 - b. State how the specification addresses factors related to removal and reinstallation of wheels; and**
 - c. Identify the significant aging effects acting on the subject components in field service, including environmental and use factors, and state how DaimlerChrysler's testing and specifications addresses each.**
- A9 A. DaimlerChrysler Corporation Engineering standard, Wheel-Stud Nut Tightening Requirements PS-3784, specifies torque limits and the proper procedure in tightening wheel stud nuts for proper retention and minimum brake rotor/hub/drum distortion.**

- B. The various engineering standards provided describe the performance standards for the wheel stud and nut that are necessary for the components to meet the engineering criteria for proper wheel attachment and durability. These standards are provided to the suppliers of these component parts and their adherence to these standards is required for validation.
- C. The four test programs that minivan vehicles must complete prior to vehicle validation are designed to ensure the overall vehicle meets durability and design robustness requirements. These programs contain procedures for the torque retention of the wheel studs/nuts and the aging and use factors associated with the attachment of the vehicle wheels.
- D. Galvanic corrosion can be a factor in the performance of the wheel attachment system. The DaimlerChrysler Corporation Vehicle Corrosion Test LP461H117 specifies a corrosion test cycle that simulates 100,000 miles of vehicle use in an extremely heavy corrosion environment and is used to validate the effect of corrosion on the wheel attachment hardware.
- E. The AMPS (Automated Manufacturing Planning System) documents provide the specified torque values for the installation of the wheel lug nuts at the assembly plant. These documents also provide for the inspection torque values when an audit is performed at the assembly plant.

The above information provides the relevant details of DaimlerChrysler's engineering standards and performance specifications relating to validation testing of the subject components. Removing and reinstalling wheels for inspection is part of DaimlerChrysler's vehicle validation testing plan. In addition to checking residual torques and visually inspecting wheel studs and nuts routinely, the stud/lug joint is "exercised" more than a typical customer would see while performing routine maintenance during the life of the vehicle.

In addition to the aforementioned standards/tests, DaimlerChrysler additionally performs several other vehicle durability tests that are not part of our standards relating specifically to stud/nut fasteners in general. For example, DaimlerChrysler performs various Powertrain Durability fleets, Brake/Suspension durability fleets, Taxi Fleets, and mileage accumulation fleets in order to prove out a vehicle's systems level performance. These tests are "real world" type evaluations and provide invaluable development data.

- Q10. Provide a table showing the following information for each wheel type used as original equipment in the peer vehicles:**
- a. The part numbers for the wheel, stud, and nut;**
 - b. The number of vehicles sold with the wheel type by model year;**
 - c. The number of incidents identified from all sources that involve (1) wheel stud failure and (2) wheel separation due to stud failure, by model year and age interval (use the following age intervals: 0 to 15,000 miles, 15,000 to 30,000 miles, and greater than 30,000 miles);**
 - d. The failure rates and DaimlerChrysler's assessment of which, if any, of the wheel types used in the peer vehicles show significantly greater rates of field failure experience than any of the other wheel types overall or in any of the stated age intervals; and**
 - e. DaimlerChrysler's assessment of the reasons why any of the peer vehicle wheel types exhibit greater failure rates than others and why any of the wheel types may experience higher rates of wheel stud failure than wheel studs in peer minivans of similar age.**

- A10**
- a) The part numbers for the wheel, stud, and nut are provided in the answer to question 7 in Enclosure 4.**
 - b) The number of vehicles sold with each wheel type is provided in the answer to question 1 in Enclosure 1-Production Data.**
 - c) The table of information relating to model year, mileage, and wheel type for each alleged incident category is provided in Enclosure 7.**
 - d) The total number of complaints (35) is very low in aggregate for a population of over 3.3 million vehicles. DaimlerChrysler believes that the data from the above table does not show any trend and/or relationship between wheel type or model year, and the alleged wheel separations and wheel stud fracture incidents. The mileage information does indicate that higher mileage vehicles experience more of the wheel stud fracture incidents than other vehicles (29 out of 35 incidents). The higher percentage of complaints from higher mileage vehicles can be expected as higher mileage vehicles have had more tire rotations and other service performed, which allows the opportunity for stud damage and improper torque application during wheel removal and re-installation.**
 - e) DaimlerChrysler's assessment is that service procedures performed on the peer vehicles are the probable cause of most wheel stud fractures and wheel separations. The older vehicles have the higher chance of this occurring only because they have seen more service than newer model vehicles. Higher than prescribed torque on the lug nuts can put excessive tension strain on the wheel stud and eventually cause fracture. If the lug nuts are below the prescribed torque, the wheel is improperly clamped to the hub allowing the wheel to put**

shearing type strain on the wheel stud with an eventual wheel stud fracture outcome.

- Q11. Provide the following information regarding wheel nut/stud torque requirements for the peer vehicles by wheel type and model year:**
- a. State the torque specifications;**
 - b. State the minimum clamping load for each nut to adequately secure the wheel to the vehicle;**
 - c. State the minimum torque necessary to achieve and maintain the clamping load stated in 11.b;**
 - d. State the maximum torque that the parts can receive without stud damage;**
 - e. Data regarding torque retention vs. time and wheel cycles for each combination of wheel, stud, and nut used in the subject vehicles;**
 - f. Describe the effect of dirt, corrosion, or other use factors on the nut torque required for item 11.c.; and**
 - g. Provide copies of all documents related to items 11.a through 11.f.**
- A11.**
- a) Automated Manufacturing Planning System (AMPS) informational documents specify specific torques in the assembly process of the minivan vehicle and include wheel lug nut torque values. Normal torque range for M12 x 1.5 size nuts is 115 to 155 Nm (85-115 ft. lbs). These documents are provided in the answer to question 8.**
 - b) The clamp load range to secure the wheel to the hub is between 4000-8000 lbs.**
 - c) To maintain the described clamp load of 4000-8000 lbs. the minimum torque for the M12 fastener is 115 Nm (85 ft. lbs.).**
 - d) The maximum torque that the wheel studs can receive without stud damage is 160 ft. lbs.**
 - e) The torque retention vs. time and wheel cycle information is not provided in any specific DaimlerChrysler engineering standard for the wheel attachment system. However, the durability testing used to validate the entire vehicle for 100,000 miles of customer use contains provisions for the checking of wheel stud nut torque and retention several times during the mileage accumulation. This is described in group C. of documents that are provided in the answer to question 8.**
 - f) Galvanic corrosion on aluminum wheels can result in high removal torque. Excessive dirt and surface contamination may result in clamp load variation at assembly. Excessive torque on steel wheels may damage the nut cone area which could restrict nut removal. Excessive torque on aluminum wheels may**

expand the wheel nut seat allowing the nut to run out of threads on the mating wheel stud. There are no specific standards that describe these factors.

In summary, DaimlerChrysler's review of complaints, warranty claims, and parts demand has not identified any issue with the subject vehicle's wheel retention system. DaimlerChrysler believes the comprehensive development testing and vehicle durability testing that each new vehicle must complete prior to volume production has greatly contributed to the superior performance of the wheel retention system on the subject vehicle population.